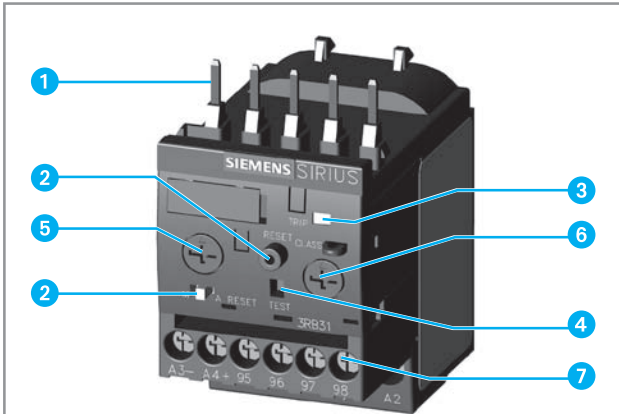


3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

Overview



- 1 Connection for mounting onto contactors:**
Optimally adapted in electrical, mechanical and design terms to the contactors. The overload relay can be connected directly to these contactor using these pins. Stand-alone installation is possible as an alternative (in conjunction with a terminal bracket for stand-alone installation).
- 2 Selector switch for manual/automatic RESET and RESET button:**
With this switch you can choose between manual and automatic RESET. A device set to manual RESET can be reset locally by pressing the RESET button. On the 3RB21 a solid-state remote is integrated into the unit.
- 3 Switch position indicator and TEST function of the wiring:**
Indicates a trip and enables the wiring test.
- 4 Solid state test:**
Enables a test of all important device components and functions.
- 5 Motor current setting:**
Setting the device to the rated motor current is easy with the large rotary knob.
- 6 Trip class setting/internal ground-fault detection (3RB21 only):**
Using the rotary switch you can set the required trip class and activate the internal ground-fault detection dependent on the starting conditions.
- 7 Connecting terminals (removable terminal block for auxiliary circuits):**
The generously sized terminals permit connection of two conductors auxiliary circuit can be connected with screw-type terminals or with spring-loaded terminals.

The 3RB and 3RB solid-state overload relays up to 630 A with internal power supply have been designed for inverse-time delayed protection of loads with normal and heavy starting (see [Function](#)) against excessive temperature rise due to overload, phase unbalance or phase failure. An overload, phase unbalance or phase failure result in an increase of the motor current beyond the set motor rated current. This current rise is detected by the current transformers integrated into the devices and evaluated by corresponding solid-state circuits which then output a pulse to the auxiliary contacts. The auxiliary contacts then switch off the load by means of the contactors control circuit. The break time depends on the ratio between the tripping current and set current I_e and is stored in the form of a long-term stable tripping characteristic (see [Characteristic Curves](#)).

In addition to inverse-time delayed protection of loads against excessive temperature rise due to overload, phase unbalance and phase failure, the 3RB21/31 solid-state overload relays also allow internal ground-fault detection (not possible in conjunction with wye-delta assemblies). This provides protection of loads against high-resistance short-circuits due to damage to the insulation material, moisture, condensed water etc.

The "tripped" status is signaled by means of a switch position indicator (see [Function](#)). Resetting takes place either manually or automatically after the recovery time has elapsed (see [Function](#)).

The devices are manufactured in accordance with environmental guidelines and contain environmentally friendly and reusable materials. They comply with important worldwide standards and approvals.

Application

Industries

The 3RB2 / 3RB3 solid-state overload relays are suitable for customers from all industries who want to provide optimum inverse-time delayed protection of their electrical loads (e.g. motors) under normal and heavy starting conditions (CLASS 5 to CLASS 30), minimize project completion times, inventories and power consumption, and optimize plant availability and maintenance management.

Application

The 3RB2 / 3RB3 solid-state overload relays have been designed for the protection of three-phase motors in sinusoidal 50/60 Hz voltage networks. The relays are not suitable for the protection of single-phase AC or DC loads.

The 3RU thermal overload relay or the 3RB22/3RB23 solid-state overload relay can be used for single-phase AC loads. For DC loads the 3RU thermal overload relays are available.

Ambient conditions

The devices are insensitive to external influences such as shocks, corrosive environments, ageing and temperature changes.

For the temperature range from -25 °C to $+60\text{ °C}$, the 3RB2 / 3RB3 solid-state overload relays compensate the temperature according to IEC 60947-4-1.

The 3RB2 / 3RB3 solid-state overload relays are suitable for the overload protection of explosion-proof motors with "increased safety" type of protection EEx e according to ATEX guideline 94/9/EC. The relays meet the requirements of EN 60079-7 (Electrical apparatus for potentially explosive atmospheres – Increased safety "e").

The basic safety and health requirements of ATEX guideline 94/9/EG are fulfilled by compliance with

- EN 60947-1
- EN 60947-4-1
- EN 60947-5-1
- EN 60079-14

EU type test certificate for Group II, Category (2) G/D under application. It has the number PTB 09 ATEX 3001.

Accessories

The following accessories are available for the 3RB2/3RB3 solid-state overload relays:

- One terminal bracket each for the overload relays size S00 and S0 (sizes S2 to S12 can be installed as single units without a terminal bracket)
- One mechanical remote RESET module for all sizes
- One cable release for resetting devices which are difficult to access (for all sizes)
- One sealable cover for all sizes
- Box terminals for sizes S6 and S10/S12
- Terminal covers for sizes S2 to S10/S12

3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

Design

Device concept

The 3RB2 / 3RB3 solid-state overload relays are compact devices, i.e. current measurement (transformer) and the evaluation unit are integrated in a single enclosure.

Mounting options

The 3RB2 / 3RB3 solid-state overload relays are suitable for direct and space-saving mounting onto 3RT1 / 3RT2 contactors and 3RW30/3RW31 soft starters as well as for stand-alone installation. For more information on the mounting options, please see [Technical Specifications and Selection and Ordering Data](#)

Connection technique

Main circuit

All sizes of the 3RB2 / 3RB3 solid-state overload relays can be connected with screw-type terminals. As an alternative for sizes S3 to S10/S12, the main circuits can be connected via the Busbar. Sizes S2 to S6 of the 3RB20/3RB21 relays are also available with a straight-through transformer. In this case, the cables of the main circuit are routed directly through the feed-through openings of the relay to the contactor terminals.

Auxiliary circuit

Connection of the auxiliary circuit (removable terminal block) is possible with either screw terminals or spring-loaded terminals.

For more information on the connection options, see [Technical Specifications and Selection and Ordering Data](#).

Overload relays in contactor assemblies for Wye-Delta starting

When overload relays are used in combination with contactor assemblies for Wye-Delta starting it must be noted that only 0.58 times the motor current flows through the line contactor. An overload relay mounted onto the line contactor must be set to 0.58 times the motor current.

When 3RB21 / 31 solid-state overload relays are used in combination with contactor assemblies for Wye-Delta starting, the internal ground-fault detection must not be activated.

Operation with frequency converter

The 3RB2 / 3RB3 solid-state overload relays are suitable for frequencies of 50/60 Hz and the associated harmonics. This permits the 3RB2 / 3RB3 overload relays to be used on the incoming side of the frequency converter.

If motor protection is required on the outgoing side of the frequency converter, the 3RN thermistor motor protection devices or the 3RU thermal overload relays are available for this purpose.

3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

Function

Basic functions

The 3RB2 / 3RB3 solid-state overload relays are designed for:

- Inverse-time delayed protection of loads from overloading
- Inverse-time delayed protection of loads from phase unbalance
- Inverse-time delayed protection of loads from phase failure
- Protection of loads from high-resistance short-circuits (internal ground-fault detection only with 3RB21 / 31).

Control circuit

The 3RB2 / 3RB3 solid-state overload relays have an internal power supply, i.e. no additional supply voltage is required.

Short-circuit protection

Fuses or motor starter protectors must be used for short-circuit protection. For assignments of the corresponding short-circuit protection devices to the 3RB2 / 3RB3 solid-state overload relays with/without contactor see [Technical Specifications and Selection and Ordering Data](#).

Trip classes

The 3RB20 / 30 solid-state overload relays are available for normal starting conditions with trip CLASS 10 or for heavy starting conditions with trip CLASS 20 (fixed setting in each case).

The 3RB21 / 31 solid-state overload relays are suitable for normal and heavy starting. The required trip class (CLASS 5, 10, 20 or 30) can be adjusted by means of a rotary knob depending on the current starting condition.

For details of the trip classes see [Characteristic Curves](#).

Phase failure protection

The 3RB2 / 3RB3 solid-state overload relays are fitted with phase failure protection (see [Characteristic Curves](#)) in order to minimize temperature rise of the load during single-phase operation.

Phase failure protection is not effective for loads with star-connection and a grounded neutral point or a neutral point which is connected to a neutral conductor.

Setting

The 3RB2 / 3RB3 solid-state overload relays are set to the motor rated current by means of a rotary knob. The scale of the rotary knob is shown in amps.

With the 3RB21 / 31 solid-state overload relay it is also possible to select the trip class (CLASS 5, 10, 20 or 30) using a second rotary knob and to switch the internal ground-fault detection on and off.

Manual and automatic reset

In the case of the 3RB2 / 3RB3 solid-state overload relays, a slide switch can be used to choose between automatic and manual resetting.

If manual reset is set, a reset can be carried out directly on the device after a trip by pressing the blue RESET button. Resetting is possible in combination with the mechanical reset options from the accessories range (see [Accessories](#)). As an alternative to the mechanical RESET options, the 3RB21 / 31 solid-state overload relays are equipped with an electrical remote RESET which may be utilized by applying a voltage of 24 V DC to the terminals A3 and A4.

If the slide switch is set to automatic RESET, the relay is reset automatically.

The time between tripping and resetting is determined by the recovery time.

Recovery time

With the 3RB2 / 3RB3 solid-state overload relays the recovery time after inverse-time delayed tripping is between 0.5 and 3 minutes depending on the preloading when automatic RESET is set. These recovery times allow the load (e.g. motor) to cool down.

If the button is set to manual RESET, the 3RB2 / 3RB3 devices can be reset immediately after inverse-time delayed tripping.

After a ground fault trip the 3RB21 / 31 solid-state overload relays (with ground-fault detection activated) can be reset immediately without a recovery time regardless of the reset mode set.

TEST function

With motor current flowing, the TEST button can be used to check whether the relay is working correctly (device/solid-state TEST). Current measurement, motor model and trip unit are tested. If these components are OK, the device is tripped in accordance with the table below. If there is an error, no tripping takes place.

Trip class	Required loading with the rated current prior to pressing the test button	Tripping within
CLASS 5	2 min	8 s
CLASS 10	4 min	15 s
CLASS 20	8 min	30 s
CLASS 30	12 min	45 s

Note: The test button must be kept pressed throughout the test.

Testing of the auxiliary contacts and the control current wiring is possible with the switch position indicator slide. Actuating the slide simulates tripping of the relay. During this simulation the NC contact (95-96) is opened and the NO contact (97-98) is closed. This tests whether the auxiliary circuit has been correctly wired.

After a test trip the relay is reset by pressing the RESET button.

Self-monitoring

The 3RB2 / 3RB3 solid-state overload relays have a self-monitoring feature, i.e. the devices constantly monitor their own basic functions and trip if an internal fault is detected.

Display of operating status

The respective operating status of the 3RB2 / 3RB3 solid-state overload relays is displayed by means of the position of the marking on the switch position indicator slide. After tripping due to overload, phase failure, phase unbalance or ground fault (ground fault detection possible only with 3RB21 / 31) the marking on the slide is to the left on the "O" mark, otherwise it is on the "I" mark.

Auxiliary contacts

The 3RB2 / 3RB3 solid-state overload relays are fitted with an NO contact for the "tripped" signal, and an NC contact for switching off the contactor.

3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

Selection and ordering data

Conversion aid 3RB10 or 3RB20 → 3RB20 or 30

Size	Old Order No.	Setting range A	New Order No.	Setting range A
S00	3RB20 16-□RB0	0.1 ... 0.4	3RB30 16-□RB0	0.1 ... 0.4
	3RB20 16-□NB0	0.32 ... 1.25	3RB30 16-□NB0	0.32 ... 1.25
	3RB20 16-□PB0	1 ... 4	3RB30 16-□PB0	1 ... 4
	3RB20 16-□SB0	3 ... 12	3RB30 16-□SB0	3 ... 12
S0	3RB20 26-□RB0	0.1 ... 0.4	3RB30 26-□RB0	0.1 ... 0.4
	3RB20 26-□NB0	0.32 ... 1.25	3RB30 26-□NB0	0.32 ... 1.25
	3RB20 26-□PB0	1 ... 4	3RB30 36-□PB0	1 ... 4
	3RB20 26-□SB0	3 ... 12	3RB30 26-□SB0	3 ... 12
	3RB20 26-□QB0	6 ... 25	3RB30 26-□QB0	6 ... 25
S2	3RB20 36-□QB0	6 ... 25	3RB30 36-□UB0	12 ... 80
	3RB20 36-□UB0	13 ... 50	3RB30 36-□UB0	12 ... 80
S3	3RB10 46-□UB0	13 ... 50	3RB30 46-□UB0	12.5 ... 50
	3RB10 46-□EB0	25 ... 100	3RB30 46-□EB0	25 ... 100
S6	3RB10 56-□FW0	50 ... 200	3RB20 56-□FW2	50 ... 200
	3RB10 56-□FG0		3RB20 56-□FC2	
S10/S12	3RB10 66-□GG0	55 ... 250	3RB20 66-□GC2	55 ... 250
	3RB10 66-□KG0	200 ... 540		
	3RB10 66-□LG0	300 ... 630	3RB20 66-□MC2	160 ... 630

CLASS 10
CLASS 20

1
2

1
2

Conversion aid 3RB10 / 21 → 3RB21 / 31

Size	Old Order No.	Setting range A	New Order No.	Setting range A
S00	3RB21 13-□RB0	0.1 ... 0.4	3RB31 13-4RB0	0.1 ... 0.4
	3RB21 13-□NB0	0.4 ... 1.6	3RB31 13-4NB0	0.32 ... 1.25
	3RB21 13-□PB0	1.5 ... 6	3RB31 13-4PB0	1 ... 4
	3RB21 13-□SB0	3 ... 12	3RB31 13-4SB0	3 ... 12
S0	3RB21 23-□RB0	0.1 ... 0.4	3RB31 23-RB0	0.1 ... 0.4
	3RB21 23-□NB0	0.32 ... 1.25	3RB31 23-NB0	0.32 ... 1.25
	3RB21 23-□PB0	1 ... 4	3RB31 23-PB0	1 ... 4
	3RB21 23-□SB0	3 ... 12	3RB31 23-4SB0	3 ... 12
S2	3RB21 33-□QB0	6 ... 25	3RB31 33-4UB0	6 ... 25
	3RB21 33-□UB0	13 ... 50	3RB31 33-4WB0	20 ... 80
	3RB10 46-□UB0	12.5 ... 50	3RB31 43-4UB0	12.5 ... 50
S3	3RB10 46-□EB0	25 ... 100	3RB31 43-4EB0	25 ... 100
	3RB10 56-□FW0	50 ... 200	3RB21 53-4FW2	50 ... 200
S6	3RB10 56-□FG0		3RB21 53-4FC2	
	3RB10 66-□GG0	55 ... 250	3RB21 63-4GC2	55 ... 250
	3RB10 66-□KG0	200 ... 540		
S10/S12	3RB10 66-□LG0	300 ... 630	3RB21 63-4MC2	160 ... 630

CLASS 10
CLASS 20

1
2

Note:

CLASS 5, 10, 20 and 30 can be set on the unit

3RB2 / 3RB3 Solid-State Overload Relays







3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

3RB20 solid-state overload relays and stand-alone installation²⁾³⁾, CLASS 10 or CLASS 20 for direct mounting¹⁾²⁾

Features and technical specifications:

- Overload protection, phase failure protection and unbalance protection
- Internal power supply
- Auxiliary contacts 1 NO + 1 NC
- Manual and automatic RESET
- Switch position indicator
- TEST function and self-monitoring

OVERLOAD RELAYS 3

Size Contactor ⁴⁾	Set current value of the inverse-time delayed overload trip	Screw Terminal Order Number	Spring Loaded Terminal Order Number	Weight per PU approx. kg		
Size S00¹⁾						
 3RB30 16-1RB0	S00	0.1 ... 0.4	3RB30 16-□RB0	3RB30 16-□RE0	0.172	
		0.32 ... 1.25	3RB30 16-□NB0	3RB30 16-□NE0	0.172	
		1 ... 4	3RB30 16-□PB0	3RB30 16-□PE0	0.172	
		3 ... 12	3RB30 16-□SB0	3RB30 16-□SE0	0.172	
		4 ... 16	3RB30 16-□TB0	3RB30 16-□TE0	0.172	
Size S0¹⁾						
 3RB30 26-1QB0	S0	0.1 ... 0.4	3RB30 26-□RB0	3RB30 26-□RE0	0.250	
		0.32 ... 1.25	3RB30 26-□NB0	3RB30 26-□NE0	0.250	
		1 ... 4	3RB30 26-□PB0	3RB30 26-□PE0	0.250	
		3 ... 12	3RB30 26-□SB0	3RB30 26-□SE0	0.250	
		6 ... 25	3RB30 26-□QB0	3RB30 26-□QE0	0.250	
	10 ... 40	3RB30 26-□VB0	3RB30 26-□VE0	0.250		
Size S2¹⁾³⁾⁵⁾						
 3RB30 36-1UB0	S2	12 ... 50	with busbar	3RB30 36-□UB0	3RB30 36-□UD0	0.360
			with pass through CT's	3RB30 36-□UW1	3RB30 36-□UX1	0.230
	20 ... 80	with busbar	3RB30 36-□WB0	3RB30 36-□WD0	0.360	
		with pass through CT's	3RB30 36-□WW1	3RB30 36-□WX1	0.230	
Size S3¹⁾³⁾⁵⁾						
 3RB30 46-1EB0	S3	12.5 ... 50	with busbar	3RB30 46-□UB0	3RB30 46-□UD0	0.560
		25 ... 100	with busbar	3RB30 46-□EB0	3RB30 46-□ED0	0.560
		with pass through CT's	3RB30 46-□EW1	3RB30 46-□EX1	0.450	
Size S6²⁾⁵⁾						
 3RB20 56-1FW2	S6	50 ... 200	with busbar	3RB20 56-□FC2	3RB20 56-□FF2	1.030
			with pass through CT's	3RB20 56-□FW2	3RB20 56-□FX2	0.690
Size S10/S12²⁾						
 3RB20 66-1MC2	S10/S12 and size 14 (3TF68/3TF69)	55 ... 250	with busbar	3RB20 66-□GC2	3RB20 66-□GF2	1.820
		160 ... 630	with busbar	3RB20 66-□MC2	3RB20 66-□MF2	1.820

2 Class 20
1 Class 10

1) The relays with an Order No. ending with "0" are designed for direct mounting to the contactor. With the matching terminal brackets (see Accessories) the sizes S00 to S3 can also be installed as stand-alone units.
 2) The relays with an Order No. ending with "2" are designed for direct mounting and stand-alone installation. For 3TF68/3TF69 contactors, direct mounting is not possible.
 3) The relays with an Order No. ending with "1" are designed for stand-alone installation.
 4) Observe maximum rated operational current of the devices.
 5) The relays with an Order No. with "X" in 10th position are equipped with a straight-through transformer.

For accessories, see pages 3/49-3/50.
 For description, see pages 3/18-3/20.
 For technical data, see pages 3/24-3/29.
 For dimension drawings, see page 3/30.
 For schematic diagrams, see page 3/31.



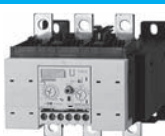
3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

3RB21 / 3RB31 solid-state overload relays for direct mounting¹⁾²⁾ and stand-alone installation²⁾³⁾, CLASS 5, 10, 20 and 30 adjustable

Features and technical specifications:

- Overload protection, phase failure protection and unbalance protection
- Internal ground fault detection (activatable)
- Internal power supply
- Auxiliary contacts 1 NO + 1 NC
- Manual and automatic RESET
- Electrical remote RESET integrated
- Switch position indicator
- TEST function and self-monitoring

	Size Contactor ⁴⁾	Set current value of the inverse-time delayed overload trip		Screw Terminal Order Number	Spring Loaded Terminal Order Number	Weight per PU approx.
		A				kg
Size S00¹⁾						
	S00	0.1 ... 0.4		3RB31 13-4RB0	3RB31 13-4RE0	0.175
		0.32 ... 1.25		3RB31 13-4NB0	3RB31 13-4NE0	0.175
		1 ... 4		3RB31 13-4PB0	3RB31 13-4PE0	0.175
		3 ... 12		3RB31 13-4SB0	3RB31 13-4SE0	0.175
		4 ... 16		3RB31 13-4TB0	3RB31 13-4TE0	0.175
Size S0¹⁾						
	S0	0.1 ... 0.4		3RB31 23-4RB0	3RB31 23-4RE0	0.215
		0.32 ... 1.25		3RB31 23-4NB0	3RB31 23-4NE0	0.215
		1 ... 4		3RB31 23-4PB0	3RB31 23-4PE0	0.215
		3 ... 12		3RB31 23-4SB0	3RB31 23-4SE0	0.215
		6 ... 25		3RB31 23-4QB0	3RB31 23-4QE0	0.215
10 ... 40		3RB31 23-4VB0	3RB31 23-4VE0	0.215		
Size S2¹⁾³⁾⁵⁾						
	S2	12 ... 50	with busbar	3RB31 33-4UB0	3RB31 33-4UD0	0.360
			with pass through CT's	3RB31 33-4UW1	3RB31 33-4UX1	0.230
		20 ... 80	with busbar	3RB31 33-4WB0	3RB31 33-4WD0	0.360
			with pass through CT's	3RB31 33-4WW1	3RB31 33-4WX1	0.230
Size S3¹⁾³⁾⁵⁾						
	S3	12.5 ... 50	with busbar	3RB31 43-4UB0	3RB31 43-4QD0	0.560
			with busbar	3RB31 43-4EB0	3RB31 43-4ED0	0.560
		25 ... 100	with pass through CT's	3RB31 43-4EW1	3RB31 43-4EX1	0.450
Size S6²⁾⁵⁾						
	S6	50 ... 200	with busbar	3RB21 53-4FC2	3RB21 53-4FF2	1.030
			with pass through CT's	3RB21 53-4FW2	3RB21 53-4FX2	0.690
Size S10/S12²⁾						
	S10/S12 and size 14 (3TF68/3TF69)	55 ... 250		3RB21 63-4GC2	3RB21 63-4GF2	1.820
		160 ... 630		3RB21 63-4MC2	3RB21 63-4MF2	1.820

- 1) The relays with an Order No. ending with "0" are designed for direct mounting to the contactor. With the matching terminal brackets (see Accessories) the sizes S00 to S3 can also be installed as stand-alone units.
- 2) The relays with an Order No. ending with "2" are designed for direct mounting and stand-alone installation. For 3TF68/3TF69 contactors, direct mounting is not possible.
- 3) The relays with an Order No. ending with "1" are designed for stand-alone installation.
- 4) Observe maximum rated operational current of the devices.
- 5) The relays with an Order No. with "X" in 10th position are equipped with a straight-through transformer.

For accessories, see pages 3/49-3/50.
 For description, see pages 3/18-3/21.
 For technical data, see pages 3/24-3/29.
 For dimension drawings, see page 3/30.
 For schematic diagrams, see page 3/31.

Technical specifications

Type	3RB30 16, 3RB31 13	3RB30 26, 3RB31 23	3RB30 36 3RB31 33	3RB30 46, 3RB31 43	3RB30 56, 3RB31 53	3RB30 66, 3RB31 63
Size	S00	S0	S2	S3	S6	S10/S12
Width	45 mm	45 mm	55 mm	70 mm	120 mm	145 mm
General data						
Trips in the event of	Overload, phase failure, and phase unbalance + ground fault (for 3RB31 only)					
Trip class according to IEC 60947-4-1	CLASS 3RB30: 10E, 20E; 3RB31: 5E, 10E, 20E or 30E adjustable					
Phase failure sensitivity	Yes					
Overload warning					No	
Reset and recovery	Manual and automatic RESET, 3RB31 has an integrated connection for electrical remote RESET (24 V DC)			3RB20: Manual and automatic RESET; 3RB21: Manual, automatic and remote RESET		
• Reset options after tripping						
• Recovery time						
- For automatic RESET	min.	Approx. 3 min		min.		Approx. 3 min
- For manual RESET	min.	Immediately		min.		Immediately
- For remote RESET	min.	Immediately		min.		Immediately
Features	<ul style="list-style-type: none"> • Display of operating status on device • TEST function 					
• RESET button	Yes					
• STOP button	No					
Explosion protection – Safe operation of motors with "Increased safety" type of protection EC type test certificate number according to directive 94/9/EC (ATEX)	PTB 09 ATEX 3001 ⊗ II (2) G [Ex e] [Ex d] [Ex px] ⊗ II (2) G [Ex t] [Ex p]		On request	PTB 09 ATEX 3001 ⊗ II (2) G [Ex e] [Ex d] [Ex px] ⊗ II (2) G [Ex t] [Ex p]		
Ambient temperatures	<ul style="list-style-type: none"> • Storage/transport °C -40 ... +80 • Operation °C -25 ... +60 • Temperature compensation °C +60 • Permissible rated current at <ul style="list-style-type: none"> - Temperature inside control cabinet 60 °C, stand-alone installation % — - Temperature inside control cabinet 60 °C, mounted on contactor % 100 - Temperature inside control cabinet 70 °C % On request 					
Repeat terminals	Yes		Not required		Yes	
• Coil repeat terminal	Yes		Not required		Yes	
• Auxiliary contact repeat terminal	Yes		Not required		Yes	
Degree of protection according to IEC 60529	IP20				IP20 ³⁾	
Touch protection according to IEC 61140	Finger-safe for vertical contact from the front				Finger-safe, for busbar connection with cover	Finger-safe with cover
Shock resistance with sine according to IEC 60068-2-27 9/ms	15/11 (signaling contact 97/98 in position "tripped": 9g/ms)		15/11 (signaling contact 97/98 in "tripped" position: 8 g/11ms)	15/11 (signaling contact 97/98 in position "tripped": 4 g/11ms)		
Electromagnetic compatibility (EMC) – Interference immunity	<ul style="list-style-type: none"> • Conductor-related interference <ul style="list-style-type: none"> - Burst according to IEC 61000-4-4 (corresponds to degree of severity 3) kV 2 (power ports), 1 (signal ports) - Surge according to IEC 61000-4-5 (corresponds to degree of severity 3) kV 2 (line to earth), 1 (line to line) • Electrostatic discharge according to IEC 61000-4-2 (corresponds to degree of severity 3) kV 8 (air discharge), 6 (contact discharge) • Field-related interference according to IEC 61000-4-3 (corresponds to degree of severity 3) V/m 10 					
Electromagnetic compatibility (EMC) – Emitted interference	Degree of severity B according to EN 55011 (CISPR 11) and EN 55022 (CISPR 22)					
Resistance to extreme climates – air humidity	% 95			% 100		
Dimensions	See dimensional drawings					
Installation altitude above sea level	m Up to 2000					
Mounting position	Any					
Type of mounting	Direct mounting/stand-alone installation with terminal support				Direct mounting / Stand-alone installation	

1) Permissible rated current in case of heavy starting
Size S0 at 10 A up to 40 A
- CLASS 20, I_e max = 32 A
- CLASS 30, I_e max = 25 A

2) 90 % for relay with current setting range 160A to 630A
3) Terminal compartment: degree of protection IP00.

Type		3RB30 16, 3RB31 13 S00 45 mm	3RB30 26, 3RB31 23 S0 45 mm	3RB30 36, 3RB31 33 S2 55 mm	3RB30 46, 3RB31 43 S3 70 mm
Main circuit					
Rated insulation voltage U_i (pollution degree 3)	V	690	690	690	1000
Rated impulse withstand voltage U_{imp}	kV	6	6	6/8	8
Rated operational voltage U_e	V	690	690	690	1000
Type of current • Direct current • Alternating current		No Yes, 50/60 Hz ± 5%			
Set current	A	0.1 ... 0.4 to 4 ... 16	0.1 ... 0.4 to 10 ... 40	12.5 ... 50 and 20 to 80	12.5 ... 50 to 25 ... 100
Power loss per unit (max.)	W	0.05 ... 0.2			0.05
Short-circuit protection - With fuse without contactor - With fuse and contactor		See Selection and Ordering Data See Technical Specifications (short-circuit protection with fuses for motor feeders)			
Protective separation between main and auxiliary conducting path according to IEC 60947-1 (pollution degree 2)	V	690 for grounded networks, otherwise 600 V			
Connection for main circuit					
Electrical connection version		Screw terminal	Screw terminal	Screw terminal	Screw terminal with box terminal /
Screw terminal					
• Terminal screw • Tightening torque • Conductor cross-sections (min./max.) - Solid or stranded	Nm mm ²	M3, Pozidriv size 2 0.8 ... 1.2 2 × (0.5 ... 1.5) ³⁾ 2 × (0.75 ... 2.5) ³⁾ 2 × (0.05 ... 4) ³⁾	M3, Pozidriv size 2 2 ... 2.5 2 × (1 ... 2.5) ³⁾ 2 × (2.5 ... 10)	M4, Pozidriv size 2 2 ... 2.5 1 × (1 ... 50) 2 × (1 ... 35) (Solid or Stranded)	M8, 4 mm Allen screw 4 ... 6 2 × (2.5 ... 16)
- Finely stranded with end sleeve (DIN 46228 T1)	mm ²	2 × (0.5 ... 1.5) ³⁾ 2 × (0.75 ... 2.5) ³⁾	2 × (1 ... 2.5) ³⁾ 2 × (2.5 ... 6) ³⁾ max. 1 × 10	2 × (1 ... 25), 1 × (1 ... 35)	2 × (2.5 ... 35), 1 × (2.5 ... 50)
- Stranded	mm ²	--			2 × (10 ... 50), 1 × (10 ... 70)
- AWG cables, solid or stranded	AWG	2 × (20 ... 16) ³⁾ 2 × (18 ... 14) ³⁾ 2 × 12	2 × (16 ... 12) ³⁾ 2 × (14 ... 8) ³⁾	2 × (18 ... 2) 1 × (18 ... 1)	2 × (10 ... 1/0), 2 × (10 ... 2/0)
- Ribbon cable conductors (number x width x circumference)	mm	--			2 × (6 × 9 × 0.8)
Busbar connections					
• Terminal screw • Tightening torque • Conductor cross-section (min./max.) - Finely stranded with cable lug - Stranded with cable lug - AWG connections, solid or stranded, with cable lug - With connecting bar (max. width)	Nm mm ² mm ² AWG mm	-- -- -- -- --			M 6 × 20 4 ... 6 2 × 70 3 × 70 2/0 12
Straight-through transformers					
• Diameter of opening	mm	--		15	18

1) For version with straight-through transformer up to 1000 VAC.
2) For version with straight-through transformer up to 8 kV.

3) If two different conductor cross-sections are connected to one clamping point, both cross-sections must lie in the range specified.

Type	3RB20 56, 3RB21 53	3RB20 66, 3RB21 63
Size	S6	S10/S12
Width	120 mm	145 mm
Main circuit		
Rated insulation voltage U_i (pollution degree 3)	V	1000
Rated impulse withstand voltage U_{imp}	kV	8
Rated operational voltage U_e	V	1000
Type of current	No	
• Direct current	Yes, 50/60 Hz \pm 5 (other frequencies on request)	
• Alternating current		
Set current	A	50 ... 200
		55 ... 250 to 160 ... 630
Power loss per unit (max.)	W	0.05
Short-circuit protection	See Selection and Ordering Data	
- With fuse without contactor	See Technical Specifications (short-circuit protection with fuses for motor feeders)	
- With fuse and contactor		
Safe isolation between main and auxiliary conducting path according to IEC 60947-1	V	690 ¹⁾
Connection for main circuit		
Electrical connection version	Screw terminal with box terminal/ Bus connection / Straight-through transformer	Screw terminal with box terminal/ Bus connection
Screw terminal		
• Terminal screw	4 mm Allen screw	5 mm Allen screw
• Tightening torque	Nm 10 ... 12	20 ... 22
• Conductor cross-sections (min./max.), 1 or 2 conductors		
- Solid	mm ² --	
- Finely stranded without end sleeve	mm ² With 3RT19 55-4G box terminal: 2 \times (1 \times max. 50, 1 \times max. 70), 1 \times (10 ... 70) With 3RT19 56-4G box terminal: 2 \times (1 \times max. 95, 1 \times max. 120), 1 \times (10 ... 120)	2 \times (50 ... 185), front clamping point only: 1 \times (70 ... 240) rear clamping point only: 1 \times (120 ... 185)
- Finely stranded with end sleeve	mm ² With 3RT19 55-4G box terminal: 2 \times (1 \times max. 50, 1 \times max. 70), 1 \times (10 ... 70) With 3RT19 56-4G box terminal: 2 \times (1 \times max. 95, 1 \times max. 120), 1 \times (10 ... 120)	2 \times (50 ... 185), front clamping point only: 1 \times (70 ... 240) rear clamping point only: 1 \times (120 ... 185)
- Stranded	mm ² With 3RT19 55-4G box terminal: 2 \times (max. 70), 1 \times (16 ... 70) With 3RT19 56-4G box terminal: 2 \times (max. 120), 1 \times (16 ... 120)	2 \times (70 ... 240), front clamping point only: 1 \times (95 ... 300) rear clamping point only: 1 \times (120 ... 240)
- AWG conductors, solid or stranded	AWG With 3RT19 55-4G box terminal: 2 \times (max. 1/0), 1 \times (6 ... 2/0) With 3RT19 56-4G box terminal: 2 \times (max. 3/0), 1 \times (6 ... 250 kcmil)	2 \times (2/0 ... 500 kcmil), front clamping point only: 1 \times (3/0 ... 600 kcmil) rear clamping point only: 1 \times (250 kcmil ... 500 kcmil)
- Ribbon cable conductors (number \times width \times circumference)	mm With 3RT19 55-4G box terminal: 2 \times (6 \times 15.5 \times 0.8), 1 \times (3 \times 9 \times 0.8 ... 6 \times 15.5 \times 0.8) With 3RT19 56-4G box terminal: 2 \times (10 \times 15.5 \times 0.8), 1 \times (3 \times 9 \times 0.8 ... 10 \times 15.5 \times 0.8)	2 \times (20 \times 24 \times 0.5), 1 \times (6 \times 9 \times 0.8 ... 20 \times 24 \times 0.5)
Busbar connections		
• Terminal screw	M 8 \times 25	M 10 \times 30
• Tightening torque	Nm 10 ... 14	14 ... 24
• Conductor cross-section (min./max.)		
- Finely stranded with cable lug	mm ² 16 ... 95 ²⁾	50 ... 240 ³⁾
- Stranded with cable lug	mm ² 25 ... 120 ²⁾	70 ... 240 ³⁾
- AWG connections, solid or stranded, with cable lug	AWG 4 ... 250 kcmil	2/0 ... 500 kcmil
- With connecting bar (max. width)	mm 15	25
Straight-through transformers		
• Diameter of opening	mm 24.5	--
• Conductor cross-section (max.)		
- NYY	mm ² 120	--
- H07RN-F	mm ² 70	--

1) For grounded networks, otherwise 600 V.

2) When connecting cable lugs according to DIN 46235, use the 3RT19 56-4EA1 terminal cover for conductor cross-sections from 95 mm² to ensure phase spacing.3) When connecting cable lugs according to DIN 46234 for conductor cross-sections from 240 mm² as well as DIN 46235 for conductor cross-sections from 185 mm², use the 3RT19 56-4EA1 terminal cover to ensure phase spacing.

Type	3RB30 16, 3RB31 13	3RB30 26, 3RB31 23	3RB30 36, 3RB31 33	3RB30 46, 3RB31 43	3RB30 56, 3RB31 53	3RB30 66, 3RB31 63
Size	S00	S0	S2	S3	S6	S10/S12
Width	45 mm	45 mm	55 mm	70 mm	120 mm	145 mm
Auxiliary circuit						
Number of NO contacts	1					
Number of NC contacts	1					
Auxiliary contacts – assignment	1 NO for the signal "tripped", 1 NC for switching off the contactor					
Rated insulation voltage U_i (pollution degree 3)	V	300				
Rated impulse withstand voltage U_{imp}	kV	4				
Auxiliary contacts – Contact rating						
• NC contact with alternating current AC-14/AC-15 Rated operational current I_e at U_e :						
- 24 V	A	4				
- 120 V	A	4				
- 125 V	A	4				
- 250 V	A	3				
• NO contact with alternating current AC-14/AC-15: Rated operational current I_e at U_e :						
- 24 V	A	4				
- 120 V	A	4				
- 125 V	A	4				
- 250 V	A	3				
• NC, NO contact with direct current DC-13: Rated operational current I_e at U_e :						
- 24 V	A	2				
- 60 V	A	0.55				
- 110 V	A	0.3				
- 125 V	A	0.3				
- 250 V	A	0.11				
• Continuous thermal current I_{th}	A	5				
• Contact reliability (suitability for PLC control; 17 V, 5 mA)		Yes				
Short-circuit protection						
• With fuse						
- gL/gG operational class	A	6				
Ground-fault protection (only 3RB31)						
• Tripping value I_{Δ}						
• Operating range I						
• Response time t_{trip} (in steady-state condition)	s	The information refers to sinusoidal residual currents at 50/60 Hz. > $0.75 \times I_{motor}$ Lower current setting value < I_{motor} < $3.5 \times$ upper current setting value < 1				
Integrated electrical remote RESET (only 3RB31)						
Connecting terminals A3, A4		24 V DC, max. 200 mA for approx. 20 ms, then < 10 mA				
Protective separation between main and auxiliary conducting path according to IEC 60947-1	V	300				
CSA, UL, and UR rated data						
Auxiliary circuit – switching capacity						
3RB30: B600, R300 3RB31: B300, R300				B300, R300		
Connection of the auxiliary circuit						
Connection type						
Screw terminal or spring-loaded terminals						
Screw terminal						
• Terminal screw						
• Tightening torque						
	Nm	Pozi driv size 2 0.8 ... 1.2				
• Conductor cross-sections (min./max.), 1 or 2 conductors						
- Solid or stranded	mm ²	1 × (0.5 ... 4), 2 × (0.5 ... 2.5)				
- Finely stranded with end sleeve	mm ²	1 × (0.5 ... 2.5), 2 × (0.5 ... 1.5)				
- AWG conductors, solid or stranded	AWG	2 × (20 ... 14)				
Spring-loaded terminals						
• Conductor cross-sections (min./max.), 1 or 2 conductors						
- Solid	mm ²	2 × (0.25 ... 1.5)				
- Finely stranded without end sleeve	mm ²	--				
- Finely stranded with end sleeve	mm ²	2 × (0.25 ... 1.5)				
- Stranded	mm ²	2 × (0.25 ... 1.5)				
- AWG conductors, solid or stranded	AWG	2 × (24 ... 16)				

3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

Short-circuit protection with fuses for motor starters

For short-circuit currents up to 50 kA at 400 to 690 V

Overload relays	Contactor	CLASS									690 V	
		5 and 10			20			30			Fuse links ¹⁾	Type of coordination ²⁾
Setting range	Type	Rated operational current I_e AC-3 in A at										
		400 V	500 V	690 V	400 V	500 V	690 V	400 V	500 V	690 V	1	2
Size S00												
0.1 ... 0.4 A	3RT20 15	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	35	4
0.32 ... 1.25 A	3RT20 15	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	35	6
1 ... 4 A	3RT20 15	4	4	4	4	4	4	4	4	4	35	20
	3RT20 16	4	4	4	4	4	4	4	4	4	35	20
	3RT20 17	4	4	4	4	4	4	4	4	4	35	20
4 ... 16 A	3RT20 16	9	6.5	5.2	9	6.5	5.2	9	6.5	5.2	35	20
	3RT20 17	12	9	6.3	10	9	6.3	9	9	6.3	35	20
	3RT20 18	16	12.4	8.9	12.9	11.6	8.1	11.6	11.6	8.1	50	25
Size S0												
3 ... 12 A	3RT20 23	9	6.5	5.2	9	6.5	5.2	--	--	--	63	25
	3RT20 24	12	12	9	12	12	9	12	12	9	63	25
	3RT20 25	12	12		12	12	12	12	12	12	63	25
10 ... 40	3RT20 24	12	12	9	12	12	9	12	12	9	63	25
	3RT20 25	17	17	13	16	16	13	14	14	13	63	25
	3RT20 26	25	18	13	16	16	13	14	14	13	100	35
	3RT20 27	32	32	21	18.6	18.6	15.1	16.2	16.2	15.1	125	50
	3RT20 28	38	32	21	22.4	22.4	18.2	19.6	19.6	18.2	125	50
Size S2												
12.5 ... 50 A	3RT20 35	40	40	24	40	40	24	36	36	36	160	80
	3RT20 36	50	50	24	45	45	24	38	38	24	160	80
	3RT20 37	50	50	47	48	48	47	42	42	42	250	125
	3RT20 38	50	50	50	49	49	49	43	43	43	250	160
20 ... 80 A	3RT20 35	40	40	24	40	40	24	36	36	36	160	80
	3RT20 36	50	50	24	45	45	24	38	38	24	160	80
	3RT20 37	65	65	47	48	48	47	42	42	42	250	125
	3RT20 38	80	80	58	49	49	49	43	43	43	250	160
Size S3												
12.5 ... 50 A	3RT20 45	50	50	47	49	49	47	41.7	41.7	41.7	200	125
	3RT20 46	50	50	50	50	50	50	45	45	45	200	160
32 ... 115 A	3RT20 45	65	65	47	49	49	47	41.7	41.7	41.7	200	125
	3RT20 46	80	80	58	53	53	53	45	45	45	200	160
	3RT20 47	95	95	58	59	59	58	50	50	50	200	160
	3RT10 54	100	100	100	81.7	81.7	81.7	69	69	69	355	315
	3RT10 55	--	--	--	100	100	100	90	90	90	355	315
Size S6												
50 ... 200 A	3RT10 54	115	115	115	81.7	81.7	81.7	69	69	69	355	315
	3RT10 55	150	150	150	107	107	107	90	90	90	355	315
	3RT10 56	185	185	170	131	131	131	111	111	111	355	315
Size S10/S12												
55 ... 250 A	3RT10 64	225	225	225	160	160	160	135	135	135	500	400
	3RT10 65	250	250	250	188	188	188	159	159	159	500	400
	3RT10 66	250	250	250	213	213	213	180	180	180	500	400
160 ... 630 A	3RT10 64	225	225	225	160	160	160	--	--	--	500	400
	3RT10 65	265	265	265	188	188	188	--	--	--	500	400
	3RT10 66	300	300	300	213	213	213	180	180	180	500	400
	3RT10 75	400	400	400	284	284	284	240	240	240	630	400
	3RT10 76	500	500	450	355	355	355	300	300	300	630	500
	3RT12 64	225	225	225	225	225	225	173	173	173	500	500
	3RT12 65	265	265	265	265	265	265	204	204	204	500	500
	3RT12 66	300	300	300	300	300	300	231	231	231	500	500
	3RT12 75	400	400	400	400	400	400	316	316	316	800	800
	3RT12 76	500	500	500	500	500	500	385	385	385	800	800
	3TF68 ³⁾	630	630	630	440	440	440	376	376	376	800	500 ⁴⁾
	3TF69 ³⁾	630	630	630	572	572	572	500	500	500	800	630 ⁴⁾

1) Please observe operational voltage.

2) Coordination and short-circuit equipment according to EN 60947-4-1:

Type of coordination 1: the contactor or starter must not endanger persons or the installation in the event of a short-circuit.

They do not need to be suitable for further operation without repair and the renewal of parts.

Type of coordination 2: the contactor or starter must not endanger persons or the installation in the event of a short-circuit.

They must be suitable for further operation. There is a risk of contact welding.

3) Contactor cannot be mounted.

4) Please ensure that the maximum AC-3 operational current has sufficient safety clearance from the rated current of the fuses.

3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

Characteristic curves

The tripping characteristics show the relationship between the tripping time and tripping current as multiples of the set current I_e and are given for symmetrical three-pole and two-pole loads from the cold state.

The smallest current used for tripping is called the minimum tripping current. According to IEC 60947-4-1, this current must be within specified limits. The limits of the total tripping current for the 3RB20/3RB21 solid-state overload relays for symmetrical three-pole loads are between 105 % and 120 % of the set current.

The tripping characteristic starts with the minimum tripping current and continues with higher tripping currents based on the characteristics of the so-called trip classes (CLASS 10, CLASS 20 etc.). The trip classes describe time intervals within which the overload relays have to trip with 7.2 times the set current I_e from the cold state for symmetrical three-pole loads.

The tripping times according to IEC 60947-4-1, tolerance band E, are as follows for:

Trip class	Tripping time
CLASS 5	3 ... 5 s
CLASS 10	5 ... 10 s
CLASS 20	10 ... 20 s
CLASS 30	20 ... 30 s

The tripping characteristic for a three-pole overload relay from the cold state (see illustration 1) only apply if all three phases are simultaneously loaded with the same current. In the event of a phase failure the 3RB20/3RB21 solid-state overload relays switch off the contactor more quickly in order to minimize heating of the load in accordance with the tripping characteristic for two-pole loads from the cold state (see illustration 2). With phase unbalance the devices switch off depending on the reason for the unbalance between the two characteristic curves.

Compared with a cold load, a load at operating temperature obviously has a lower temperature reserve. The tripping time of the 3RB2/3RB3 solid-state overload relays is reduced therefore to about 30 % when loaded with the set current I_e for an extended period.

Tripping characteristics for 3-pole loads

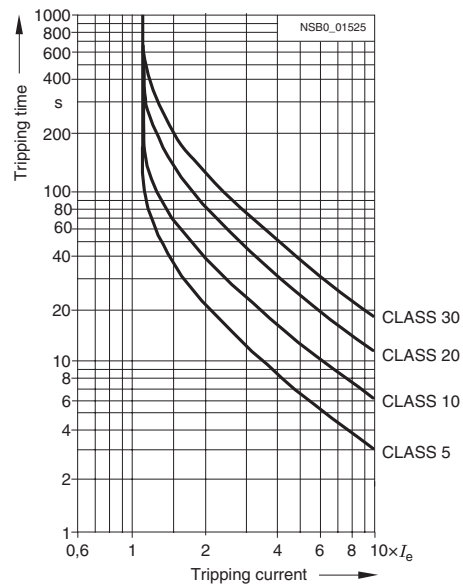


Illustration 1

Tripping characteristics for 2-pole loads

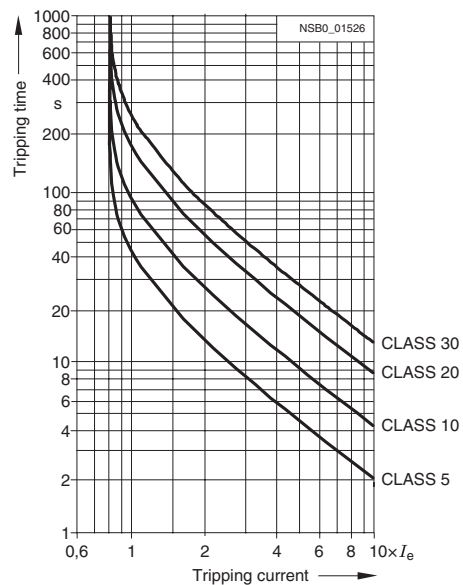


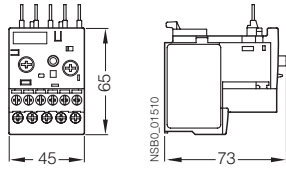
Illustration 2

The above illustrations are schematic representations of characteristic curves.

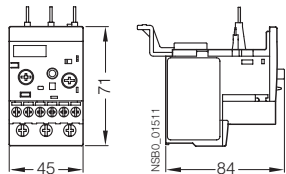
3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

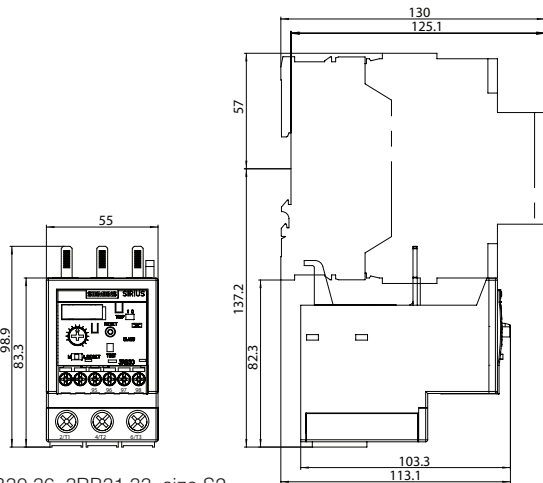
Dimensional drawings



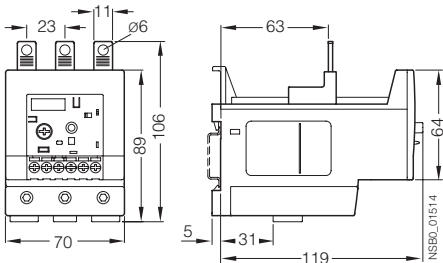
3RB30 16, 3RB31 13, size S00



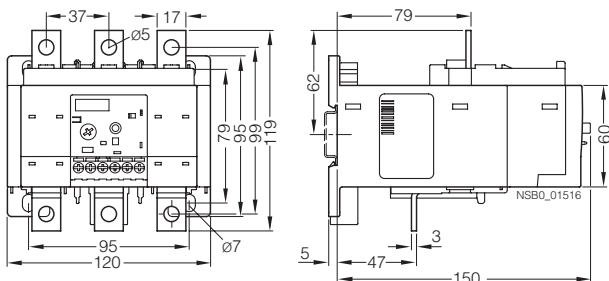
3RB30 26, 3RB31 23, size S0



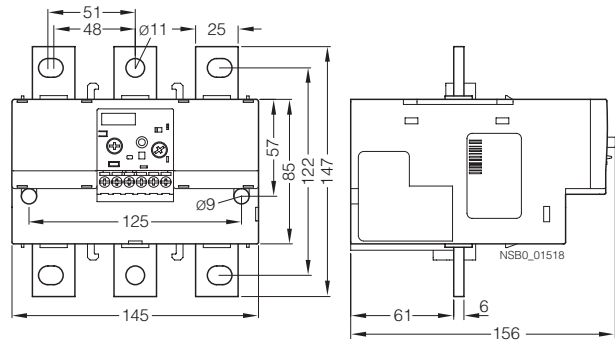
3RB30 36, 3RB31 33, size S2



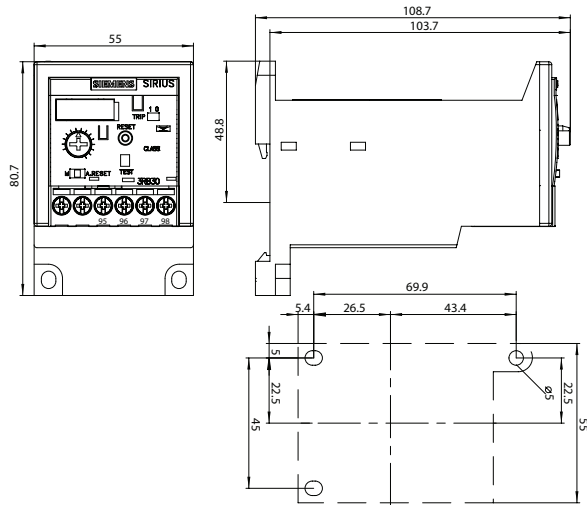
3RB30 46, 3RB31 43, size S3



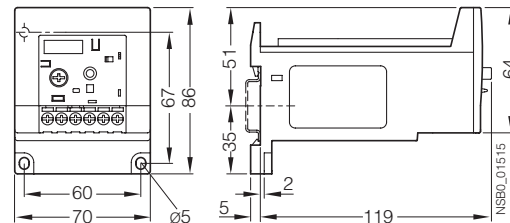
3RB20 56, 3RB21 53, size S6



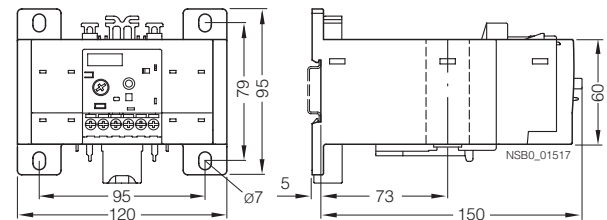
3RB20 66, 3RB21 63, size S10/S12



3RB30 36, 3RB31 33, size S2 with straight-through transformer



3RB30 46, 3RB31 43, size S3 with straight-through transformer

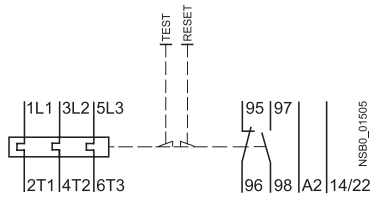


3RB20 56, 3RB21 53, size S6 with straight-through transformer

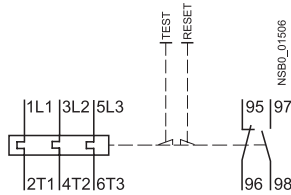
3RB2 / 3RB3 Solid-State Overload Relays

3RB20, 3RB21, 3RB30, 3RB31 up to 630A for standard applications

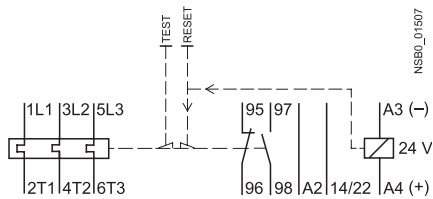
Schematics



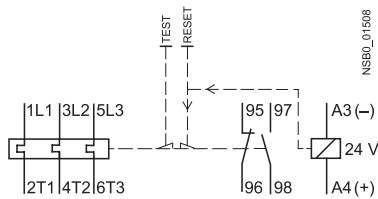
3RB30 16 overload relays



3RB30 26 to 3RB20 66 overload relays



3RB31 13 overload relays



3RB31 23 to 3RB21 63 overload relays